# A NEW FOSSIL REPTILE FROM THE TRIASSIC OF NEW JERSEY

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## INTRODUCTION

Through the generosity of Dr. C. N. Fenner of the Geophysical Laboratory, Carnegie Institution of Washington, the United States National Museum has come into possession of a fossil specimen of considerable scientific interest. Found in the Upper Triassic of New Jersey, this specimen is important as adding one more form to the meagerly known fauna of that geological period.

Under date of October 19, 1926, Doctor Fenner wrote me regarding the discovery of this specimen as follows:

> It was found on or about September 10, 1926, by Herbert R. Fenner, 64 Broad Street, Clifton, at the intersection of the street with the tracks of the Delaware, Lackawanna, and Western Railroad. An excavation was being made there to change the grade of the street and carry it under the railroad tracks and the specimen had evidently been turned up in these operations. It was found as a loose slab. Search was made in the vicinity for the missing portions of the skeleton, but they were not found.
>
> While I was at my brother's home last summer I visited the excavation a number of times and took note of the character of the strata. They consisted of the usual irregularly bedded alternations of reddish brown sandstone and shale that are characteristic of the Triassic of this region. There are occasional thin beds or strings of pebbles. Frequently the dividing surfaces between sandy layers were smooth, almost glossy, films of shale, such as might be left by the drying up of a pool of muddy water and very pretty rill markings were common, but no mud cracks or ripple marks. The smooth films of shale carried many small circular markings, perhaps bubble rings. There were also numerous little oval lumps of which the structure was too poorly preserved for any definite conclusion, but they vaguely suggested replacements of vegetable growths, such as cones or collections of short, acicular leaves.
>
> The locality is about 0.3 mile to the east of the First Watchung trap ridge, and the gentle westerly dip would make the stratigraphic position about 400 feet below the base of the sheet, if there are no intervening faults. As you doubtless know, the Triassic of this region has been supposed to be entirely Upper Triassic.

At first glance the specimen gives the impression of being in an excellent state of preservation, but this idea is soon dispelled when

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its study is begun. Those details of structure so essential for reaching a satisfactory decision as to affinities and relationships are largely wanting, and for that reason its classification within the order Reptilia remains much in doubt. However, it seems to represent an undescribed genus and species for which the name *Hypsognathus fenneri* is proposed, the specific name being in honor of Mr. Herbert R. Fenner, who found the type specimen. The illustrations were made by Mr. Sydney Prentice, draughtsman of the Carnegie Museum, Pittsburgh.

## DESCRIPTION OF SPECIMEN

### HYPSOGNATHUS, new genus

The characters of this genus are included in the following description of the type and only species:

#### HYPSOGNATHUS FENNERI, new species

*Type.*—Cat. No. 11,643, U.S.N.M. Consists of bone impressions of much of the axial skeleton anterior to the pelvic region.

*Type locality.*—Clifton, Passaic County, New Jersey.

*Geological horizon.*—Brunswick shale, Upper Triassic.

When received the specimen was imbedded in a single block of sandstone, the ventral side downward (see pl. 1) and, with the exception of some disarrangement of the neck vertebrae, the remaining parts of the axial skeleton more or less articulated. The posterior vertebral column, from a point in front of the sacrum, is missing, having been inclosed in another slab of rock which was not recovered. Likewise, the skull and upper parts of the vertebrae and ribs were held in the block of sandstone that split off the top of the specimen and for which unsuccessful search was made by Mr. Fenner. The lower jaws occupy their proper relative position in front of the vertebral column, and the ribs of both right and left sides are spread out in sequential order on either side of the line of vertebrae. Of the appendicular skeleton only the proximal end of a humerus and portions of one foot are recognized; the latter, from its position in relation to the skeleton is regarded as being the left manus.

Unfortunately, the soft chalky nature of the fossil bone did not permit developing the skeleton along the usual lines by freeing it from the matrix, and it was only after some experimentation that it was decided to remove the bones so as to leave their natural molds in the rock. (Pl. 2.)

Casts were then made of these impressions, thus securing accurate replicas of many of the actual bones. For purposes of study and description these casts were found to serve almost as well as the originals.

*Skull and lower jaws.*—The skull is entirely missing except for the articular ends of the quadrate bones which remained in an articulated position in relation to the lower jaw. This fact leads to the conclusion that the skull was originally present. The impression left by the removal of the left quadrate shows the articular end to have been bi-lobed. Measured across the quadrates the skull had a greatest width of 48.5 millimeters and from the anterior end of the rami to the center of the articular end of the quadrate it measures 42.5 millimeters, which allows the inference that the length and width of the skull were about equal.

The impressions left by the mandibles show them to lie in perfect relation to each other. They are broadly separated behind, and in front turn strongly inward to form a relatively wide, broadly rounded anterior end. The two rami meet in a strong sutural symphysis in which apparently the splenial bones did not participate. The striking characteristics of the mandible are the great depth of the prearticular portion and the transversely swollen character of the median portion of the jaws which enclosed the large Meckelian orifice. The postarticular processes are relatively short, thin dorsoventrally but widened transversely, especially on the outer border where a thin shelf of bone is developed that becomes gradually wider in an anterior direction, reaching its maximum width slightly forward of the cotylus of the jaw. This feature is clearly shown in Figure 1, a sketch made from a cast of the impression left in the rock.

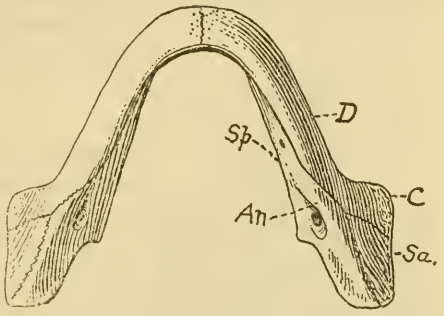


FIG. 1.—HYPSOGNATHUS FENNERI, NEW SPECIES. TYPE, CAT. NO. 11643, U.S.N.M. NATURAL SIZE. LOWER JAWS, INFERIOR VIEW. DRAWN FROM A CAST MADE FROM THE NATURAL MOLD IN THE ROCK. *An*, ANGULAR; *C*, CORONOID; *D*, DENTARY; *Sa*. SURANGULAR; *Sp*. SPLENIAL

Viewed externally the angular is plainly visible as a triangular area interposed between the lower posterior end of the dentary and the lower anterior end of the surangular. The suture separating the angular from the surangular appears to pass backward nearly to the extremity of the jaw. The surangular is relatively short, its anterior extremity being about opposite the middle of the coronoid process. The dentary as usual forms the great part of the ramus and except for the dentigerous border its mold is completely preserved. Although much of the bony matter of the dentaries was present when the specimen was received, nowhere did I find evidence of tooth roots or the presence of alveoli. This would seem to indicate that if teeth were present they were not held in distinct sockets, and this

fact allows the suggestion that the dentation may have been acrodont in character.

None of the sutures on the internal side of the jaws can be detected, rendering it impossible to differentiate the elements. Meckel's groove is prominently developed and leads back to the enlarged cavity in the swollen part of the jaw. It would seem that the forward part of this groove was open and that it was not covered by the splenial as in many reptiles. There seems to have been a small subcircular internal mandibular foramen at a point immediately opposite the coronoid section of the jaw. (See fig. 1.) A slight indentation immediately forward of the midlength of the ramus on the inner side strongly suggests the presence of a second but smaller foramen.

The unusual height of the mandible as a whole, its relatively short surangular, receding chin, and transversely swollen portion posterior to the middle are all features found in the jaw of the cotylosaurian reptile *Diadectes.*

FIG. 2.—HYPSOGNATHUS FENNERI, NEW SPECIES. TYPE, CAT. NO. 11643, U.S.N.M. ANTERIOR (1) DORSAL VERTEBRA. VIEWED FROM THE ANTERIOR END. NATURAL SIZE. DRAWN FROM A CAST MADE FROM THE NATURAL MOLD IN THE ROCK

*Measurements*

| | Millimeters |
|---|---|
| Greatest length of mandible | 46.5 |
| Greatest width across center of symphysis | 14.5 |
| Greatest width across posterior ends of rami | 48.5 |
| Greatest depth of mandible at center | +12.5 |
| Greatest width of postcornoidal part | 13.0 |
| Greatest width at center of ramus | 7.3 |

*Vertebrae.*—Evidence is found showing the presence of at least 17 presacral vertebrae, but none is sufficiently well preserved to show the complete details of structure. Those immediately posterior to the lower jaws are widely scattered, but the remaining parts of the vertebral column were in articulated series, except for a short gap near the posterior end of the slab.

The centra are deeply amphicoelous and may have been notochoidal, though there is lack of positive evidence of this last suggestion. Neither do I find any evidence of the presence of intercentra. The zygapophyses are of good size and have the articulating planes horizontal as in *Seymouria* and *Telerpeton.* The mold of a vertebra lying on its posterior face, immediately posterior to the right ramus (pl. 3) serves to illustrate the great conical concavity of the centra. Furthermore it shows the relatively large size of the neural canal, the high arch, and the general heaviness of the vertebra as a whole as shown in Figure 2. From its position in relation to the rest of the skeleton I am led to the conclusion that it pertains either to the posterior cervical or the anterior dorsal region.

For the most part the dorsal vertebrae protruded into the overlying block of sandstone which was split off and lost, and hence little knowledge is to be had of the upper portions of the remaining dorsal vertebrae. These seem to have had broad centra with slightly concave sides with a slight median keel developed on the ventral side. Five articulated centra in the mid-presacral region have a combined length of 44 mm. Single vertebra vary from 7½ to 8 mm. in length. These measurements indicate an animal approaching the size of *Koiloskiosaurus*, a colytosaurian from the Triassic of Germany near Coburg, described by Huene.[1]

*Telerpeton* from the Triassic of Eligin, Scotland, has 24 presacral vertebrae in the complete series, and from the fragmentary evidence at hand it would seem that the specimen now before me may have had an equal number of vertebrae in the complete presacral series.

*Ribs.*—Impressions of 14 ribs of the left side and 11 of the right side are present. While only a few are preserved in their entirety, they show a gradual lengthening from the neck to the middle of the dorsal region, posterior to which they become progressively shorter and more slender. The longest rib measures 53 mm. from end to end. All of the ribs having a complete proximal end may be called single headed, though in reality both capitulum and tuberculum are probably present though connected. Williston[2] has suggested the term *holocephalous* for this type of rib articulation. He also points out that this form of articulation is almost invariable among the Cotylosauria, occurring occasionally in the Theromorpha and in the living *Sphenodon*. Those ribs that remain in articulated position, and there are at least eight of them, have their heads lying opposite the sides of their respective centra, a fact that seems to indicate their articulation to have been with transverse processes on the side of the vertebrae and not intercentral.

*Pectoral girdle.*—Two deep, slot-like impressions lying on either side of the vertebral column and in front of the longer ribs (fig. 3*S*), a position entirely in accord with the relative position of the pectoral girdle, are doubtfully regarded as having been made by the blade portions of the scapulae. The one point opposed to such a conclusion is the fact that the greatest diameter of these impressions lies transverse to the vertebral series, whereas, in the properly articulated skeleton the longer diameter of these bones would be more or less parallel with the backbone. Further development might disclose the true nature of these molds but this course was deemed inadvisable inasmuch as surrounding impressions would be destroyed. If these do represent the pectoral bones, and if they occupy their proper position in relation to the lower jaws, it would be evidence

[1] Huene, F. von, Die Cotylosauria der Trias, Palaeontographica, vol. 59, 1919, p. 75.
[2] Williston, S. W., Osteology of the Reptiles, 1926, p. 113.

opposed to cotylosaurian affinities, as Williston states that "the pectoral girdle [in the Cotylosauria] is almost invariably found lying immediately back of the skull, the front end of the interclavicle, indeed, between the angle of the jaws." If this is true, I would favor an assignment to the Theromorpha on account of the longer neck.

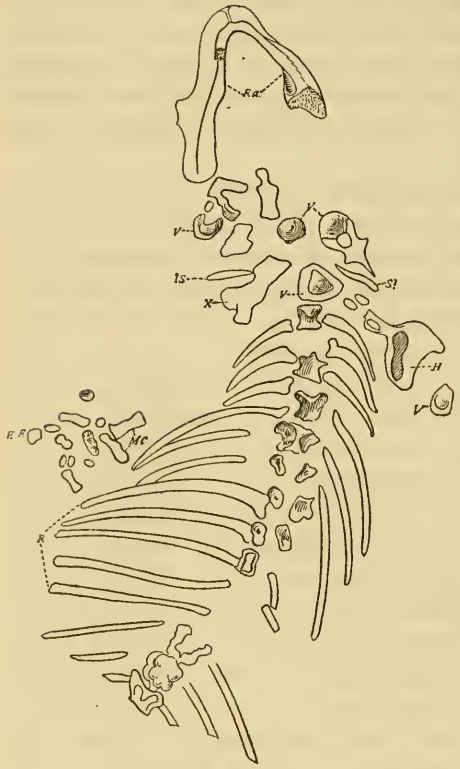


FIG. 3.—HYPSOGNATHUS FENNERI, NEW SPECIES. TYPE, CAT. NO. 11643, U.S.N.M. OUTLINE OF SKELETON AS FOUND IN THE ROCK. ABOUT ONE-HALF NATURAL SIZE. *F. F.*, ELEMENTS OF LEFT FORE FOOT; *H*, PROXIMAL END OF HUMERUS; *mc*, METACARPALS; *R*, RIBS; *Ra*, RAMI; *S*, SCAPULAE; *V*, VERTEBRAE; *X*, UNIDENTIFIED BONE

*Fore foot.*—The natural molds of a group of small disarticulated bones on the left side of the skeleton and clear of the rib ends are regarded as being the elements of the left fore foot. (See fig. 3, *F. F.*) Two of the longest of these are thought to be metacarpal bones (see fig. 3, *mc.*); the longest has a greatest length of 10 mm., the other 9.4 mm. The molds of some smaller bones lying anterior to the metacarpals may represent carpal bones, but I have been unable to identify any of them. Obscure indications show the presence of phalangeal elements, including one slightly curved, pointed, ungual phalanx that has a greatest length of 5.5 mm. The preservation is such that I have been unable to positively identify the proper articulated relationships of any of these scattered bones. One of the metacarpal bones has a wide shaft with expanded extremities, while the longest has a shaft that is subcircular in cross-section.

## DISCUSSION OF RELATIONSHIPS

In the absence of the skull and other diagnostic parts of the skeleton no satisfactory conclusion has been reached concerning the family and other relationships of the specimen under consideration. The presence of holocephalous ribs, deeply amphicoelous vertebrae, dentary of unusual height with receding chin, and mandible greatly

swollen transversely are a combination of characters in which *Hypsognathus* seems to show cotylosaurian affinities. On the other hand, as Dr. E. C. Case has pointed out to me, the relatively narrow and high neural arches of the vertebrae seem to be opposed to such a relationship. After an examination of a cast of the type specimen he says:

> The neural arches of all cotylosaurs are low and very broad; this is high. I know of no exception to this rule, low broad neural arches in the Cotylosauria. Broili's *Solenodonsaurus* is reported by him to have narrow neural arches, but others who have seen the specimen say this is obviously due to compression.

Perusal of the literature shows the above generalizations to be correct, though it seems to me they do not fully apply to certain of the cotylosaurians from the European Triassic described by Huene.[3] Reference is made to the vertebrae of *Koiloskiosaurus*, which appears to have a neural arch equally as high and narrow as the vertebrae of *Hypsognathus*. The spinous processes are likewise of nearly equal height. Furthermore, the lower jaw of *Kioloskiosaurus* in its considerable height with receding anterior end, and rapidly reducing height of the end posterior to the coronoid processes are features held in common with the mandible of *Hypsognathus*. If correct in my identification of a portion of a limb bone as being the proximal end of the humerus, this end is shown to be much expanded as in other cotylosaurian reptiles. The few metapodials preserved are also in accord with such relationships. While the evidence thus briefly reviewed is insufficient to certainly determine the affinities of the present specimen to lie within the Cotylosauria, it nevertheless strongly suggests such relationship.

Of the few known elements of the Upper Triassic fauna of North America *Stegomosuchus longipes* (Emerson and Loomis) is the only form that need be compared with the present specimen. The larger size of *Hypsognathus*, the absence of dermal armor, the deeper heavier mandible, and the short and stout metapodials are a group of features that seem quite sufficient to show its distinctness from that species. In size and general proportions it closely approximates *Koiloskiosaurus coburgiensis* Huene, and in general appearance it would probably not be greatly unlike Huene's restoration of that animal.

On account of the several resemblances to certain Triassic cotylosaurians discussed above I propose to provisionally refer *Hypsognathus fenneri* to the Order Cotylosauria in the hope that the discovery of better preserved and more diagnostic specimens will either confirm this tentative reference or reveal its true relationships.

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[3] Die Cotylosauria der Trias, Palaeontolographica, vol. 59, 1912, pp. 69 to 102.

## EXPLANATION OF PLATES

### PLATE 1

*Hypsognathus fenneri*, new species. Type, Cat. No. 11643, U.S.N.M. About three-fourths natural size. Shows the condition of the specimen as received.

### PLATE 2

*Hypsognathus fenneri*, new species. Type, Cat. No. 11643, U.S.N.M. About three-fourths natural size. Shows the natural molds of the various bones of the specimen after the removal of the chalky osseous matter.

### PLATE 3

*Hypsognathus fenneri*, new species. Type, Cat. No. 11643, U.S.N.M. More than three-fourths natural size. Wash drawing which more clearly depicts the form and relationships of the preserved skeletal parts.

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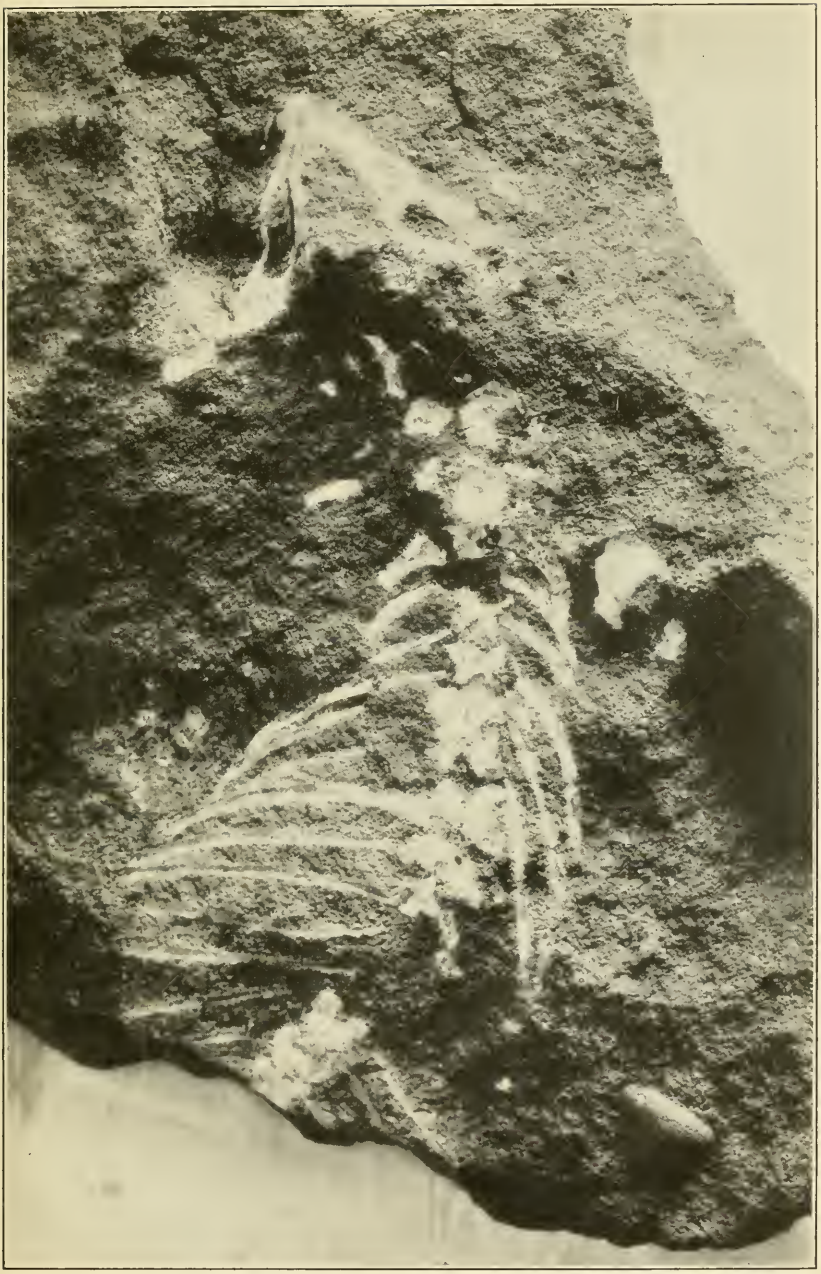
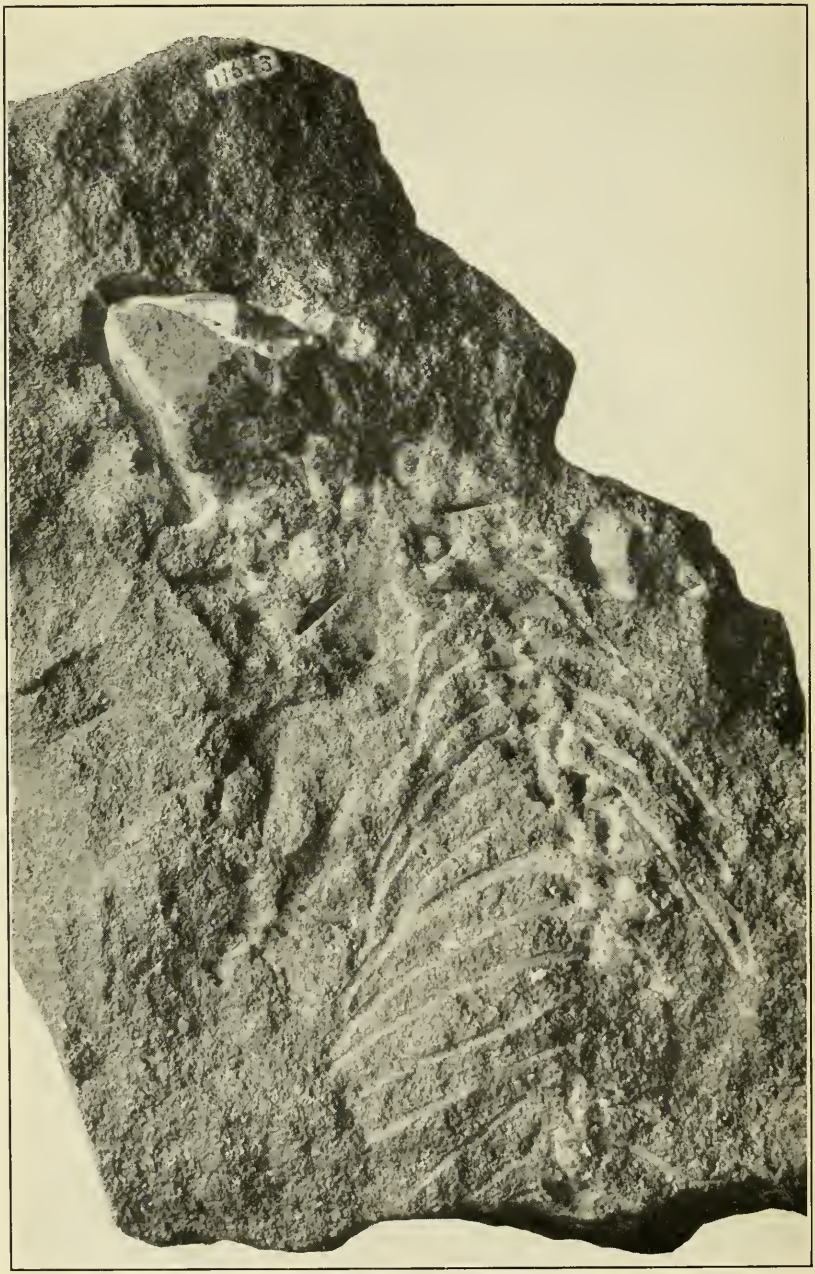


HYPSOGNATHUS FENNERI, NEW SPECIES

FOR EXPLANATION OF PLATE SEE PAGE 8

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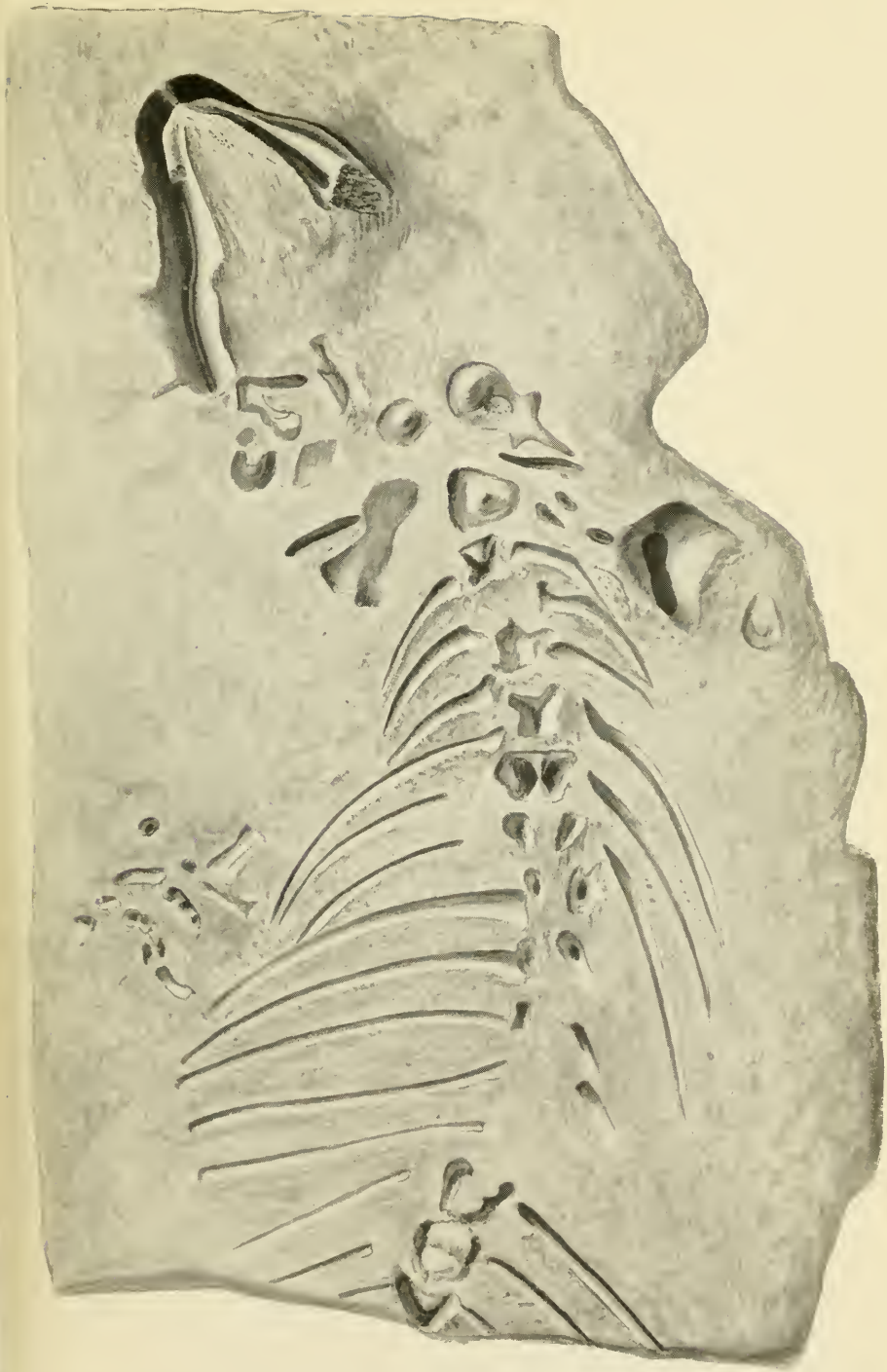

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